

PATENT
60003206-1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of:

GARCIA et al.

Serial No. 09/941,884

Filed: 08/28/2001

For: DIAGNOSTIC FOR VISUAL
DETECTION OF MEDIA
ADVANCE ERRORS

) Art Unit: 2853

) Examiner: Nguyen, Lam S.

SUBSTITUTE APPEAL BRIEF IN RESPONSE TO
SECOND NEW GROUND OF REJECTION;
REQUEST FOR MAINTAINING APPEAL
(RULE 41.41)

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SUBSTITUTE APPEAL BRIEF IN RESPONSE TO
SECOND NEW GROUND OF REJECTION;
REQUEST FOR MAINTAINING APPEAL
(RULE 41.41)Commissioner for Patents
P.O. Box 1450
Alexandria, VA

Sir:

This appeal was originally taken from the Office's final rejection of Claims 1, 3-10, 12-18 and 22 mailed June 21, 2004, in the subject application. Appellants' appeal brief was filed November 22, 2004. In response to the appeal brief, in an office action mailed February 10, 2005 (the "Office action"), the Examiner withdrew the final rejection, and asserted new grounds of rejection. Appellants elected to maintain the appeal, pursuant to Rule 41.41, and submitted a reply brief addressing the new grounds of rejection on April 28, 2005.

In response to the reply brief filed April 28, 2005, an office action was mailed on June 30, 2005, setting out further new grounds of rejection. The previously asserted grounds of rejection have apparently been withdrawn. Appellants elect to maintain this appeal, and submit this substitute appeal brief for this purpose.

The format of this brief follows the direction given in the Office's answer to comment 72, regarding the proposed new Rules of Practice before the Board of Patent Appeals and Interferences, published in the Federal Register on August 12, 2004.

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I. REAL PARTY IN INTEREST.

The real party in interest is the assignee, Hewlett-Packard Development Company, L.P.

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II. RELATED APPEALS AND INTERFERENCES.

There are no related appeals, interferences or judicial proceedings known to appellants, the appellants' legal representative, or assignee.

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III. STATUS OF ALL THE CLAIMS.

Claims 1-22 were filed with this application. During the course of prosecution before the Primary Examiner, Claim 19 was cancelled. Claims 1-18 and 20-22 in their present, amended form appear in Appendix 1 to the Appeal Brief. Claims 2 and 11 have been allowed. Claims 1-18 and 20-22 are the only claims pending in this case.

Claims 1, 3-10, 12-18 and 20-22 are at issue in this appeal. The grounds of rejection set out in the Final Rejection have been withdrawn, as have the new grounds of rejection applied, in the Office Action mailed February 10, 2005. New grounds of rejection have been applied in the office action mailed June 30, 2005.

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IV. STATUS OF ALL AMENDMENTS FILED SUBSEQUENT TO
FINAL REJECTION.

No amendments have been filed subsequent to the final rejection.

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V. SUMMARY OF THE INVENTION.

The page and line numbers referred to herein are to the specification; reference characters are found in the drawing.

Independent Claim 1 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- entering a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed [9:4-7; FIG. 13, 200; FIG. 14, 220];

- printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

- examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 228].

Claim 3 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9] wherein said different areas are nominally aligned along a horizontal line [FIGS. 11, 12]; and

- examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 4 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

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printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user [FIG. 13, 208; 17:15-22].

Claim 6 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

checking for printhead health and taking any corrective needed action to recover nozzle health [16:28 to 17:14; FIG. 13, 206-207];

during a diagnostic mode in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 8 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed [9:4-7; FIG. 13, 200; FIG. 14, 220], printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9], said printing different areas of a diagnostic pattern comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by

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a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, and wherein said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i) [9:23 to 13:7; FIGS. 9 and 10A-10C]; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 9 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed [9:4-7; FIG. 13, 200; FIG. 14, 220], printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9], said printing of a diagnostic pattern comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i), wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes [9:23 to 13:7; FIGS. 9 and 10A-10C]; and

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examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 10 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead [38, FIG. 2] mounted on a carriage, the carriage [31, FIG. 2] mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium [33, FIG. 1] along a media path [13, FIG. 1] which is transverse to the scan axis;

entering a diagnostic multi-pass print mode in which mode normal printing jobs of the printing system are not printed [9:4-7; FIG. 13, 200; FIG. 14, 220];

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 13 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead [38, FIG. 2] mounted on a carriage [31, FIG. 2], the carriage mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium [33, FIG. 1] along a media path which is transverse to the scan axis [13, FIG. 1];

entering a diagnostic multi-pass print mode [9:4-7; FIG. 13, 200; FIG. 14, 220];

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printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user [FIG. 13, 208; 17:15-22].

Claim 15 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead [38, FIG. 2] mounted on a carriage [31, FIG. 2], the carriage mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium along a media path which is transverse to the scan axis [13, FIG. 1];

entering a diagnostic multi-pass print mode [9:4-7; FIG. 13, 200; FIG. 14, 220];

checking for printhead health and taking any corrective needed action prior to printing a diagnostic pattern [16:28 to 17:14; FIG. 13, 206-207];

printing different areas of the diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [FIG. 13, 208; FIG. 14, 222; 9:4 to 15-9]; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 17 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

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providing an ink-jet printhead [38, FIG. 2] mounted on a carriage [31, FIG. 2], the carriage mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium along a media path [13, FIG. 1] which is transverse to the scan axis;

entering a diagnostic multi-pass print mode [9:4-7; FIG. 13, 200; FIG. 14, 220];

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [9:4-7; FIG. 13, 200; FIG. 14, 220], said printing different areas of a diagnostic plot comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, wherein said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i) [9:23 to 13:7; FIGS. 9 and 10A-10C]; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 18 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead [38, FIG. 2] mounted on a carriage, the carriage [31, FIG. 2] mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium along a media path [13, FIG. 1] which is transverse to the scan axis;

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entering a diagnostic multi-pass print mode [9:4-7; FIG. 13, 200; FIG. 14, 220];

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [9:4-7; FIG. 13, 200; FIG. 14, 220], said printing different areas of a diagnostic plot comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i), wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes [9:23 to 13:7; FIGS. 9 and 10A-10C]; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

Claim 20 is drawn to a multi-pass diagnostic print mode mask [110, FIG. 10A] for visual detection of poor media advance calibration in an ink-jet printing system including a printhead having a nozzle array, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, wherein said diagnostic print mode mask defining that the first $w/2$ pixels in the

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row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i) [9:23 to 13:7; FIGS. 9 and 10A-10C].

Claim 21 is drawn to a multi-pass diagnostic print mode mask [110, FIG. 10A] for visual detection of poor media advance calibration in an ink-jet printing system including a printhead having a nozzle array, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i), and wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are assigned to be printed in a first pass, and said last $w/2$ pixels are assigned to be printed in a last pass of said plurality of passes [9:23 to 13:7; FIGS. 9 and 10A-10C].

Claim 22 is drawn to a diagnostic method for improving print quality in an ink-jet printing system, comprising:

providing an ink-jet printhead [38, FIG. 2] mounted on a carriage [31, FIG. 2], the carriage mounted for movement along a scan axis [15, FIG. 2];

providing a media advance system [35, FIG. 3] for advancing a print medium along a media path [13, FIG. 1] which is transverse to the scan axis;

entering a diagnostic multi-pass print mode [9:4-7; FIG. 13, 200; FIG. 14, 220];

determining whether the nozzle array has good health [16:28 to 17:14; FIG. 13, 206-207];

if the nozzle array has good health, printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas [9:4-7; FIG. 13, 200; FIG. 14, 220]; and

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examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action [FIG. 13, 208; FIG. 14, 224].

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VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL.

The grounds of rejection to be reviewed on appeal are:

(i) whether Claims 1, 3-5, 10 and 12-14 are anticipated under 35 USC 102(e) by Dunand (US 6,398,334);

(ii) whether Claims 7 and 16 are unpatentable under 35 USC 103(a) over Dunand in view of Maeda et al ("Maeda") (US 6,334,659);

(iii) whether Claims 8-9, 17-18 and 20-21 are unpatentable under 35 USC 103(a) over Dunand in view of Yen et al ("Yen") (US 6,334,659), and

(iv) whether Claims 6, 15 and 22 are unpatentable over Dunand in view of Takagi et al. ("Takagi") (US 6,089,695).

These are the grounds of rejection as set out in the office action of June 30, 2005.

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VII. ARGUMENT.

For purposes of this appeal, appellants are content to stand on the differences between the claimed invention and the applied references discussed below, because these differences are sufficient to establish that a prima facie case of anticipation and obviousness has not been established, and the applied references do not teach or suggest appellants' invention. Appellants do not concede, however, that other differences do not exist.

A. The Requirements for Anticipation under Section 102(e).

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim. The elements must be arranged as required by the claim. MPEP 2131.

For reasons discussed below, the rejection under Section 102(e) should be reversed.

B. The Rejection under Section 102(e) Should Be Reversed.

Claims 1, 3-5, 10 and 12-14 have been rejected as allegedly being anticipated under 35 USC 102(e) by Dunand.

Dunand describes a process for compensation of a defect in the advance of a print substrate by modifying the arrival position of ink droplets with a variable electrical charge on the substrate. Each band of droplets is printed with a mark on the margin or edge of the substrate, the substrate is advanced to print the next band, an algebraic difference is determined between a nominal theoretical position of the mark and the real position of the mark, a correction to the value of the charge voltage to be applied to each droplet to compensate for the position error is determined, and the substrate correction is applied to each droplet in the next band, in addition to the nominal voltage. (Abstract) Thus, the printing of the mark is performed during printing of normal print jobs.

That the printing of the marginal marks is performed during printing of normal print jobs is confirmed throughout Dunand. Examples are quoted below:

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The pattern to be printed is described by a numeric file... The numeric file representing the colored pattern to be printed is firstly split into several binary patterns (or bitmaps) for each ink... Part of the binary pattern is extracted from the file for each jet corresponding to the width of the band that will be printed... FIG. 2, which shows the control electronics of a jet, shows a memory 1 in which the numeric pattern cut into bands is stored, this storage memory containing information about a color. For printing each band, an intermediate memory 2 contains the data necessary for printing the band with the said color. [Dunand, at 2:49-67]

According to the invention, a mark will be printed when printing each current band. This mark may consist of a single line printed by one or several droplets that may or may not be in consecutive rows. After the substrate has been advanced to print the next band, the error ϵ_x will be determined as the difference between the nominal position and the real position of the mark, corresponding to a difference in the advance of the substrate. [Dunand, at 4:48-55, emphasis added]

As explained above, this result will be obtained by printing a first mark shown at A in FIG. 4 when printing a current band. This mark may be composed of a single line printed using one or several droplets in a subsequent row. [Dunand, at 7:9-12, emphasis added]

The cyan head 25 prints the mark 51-1 before a first band mark 1 is printed. This same cyan head then prints the band 1 in the scanning direction shown by an arrow in the direction Y. [Dunand, at 9:3-6]

a current band is printed with a first mark on the substrate,
an algebraic difference is determined between a nominal theoretical position of the mark and the real position of the mark [Dunand, at Claim 1, 13:41-45, emphasis added]

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Claim 1:

Claim 1 recites a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

entering a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Dunand does not disclose entering a diagnostic mode as recited in Claim 1. This is clear from the above quoted passages of Dunand. Instead, the marginal marks of Dunand are printed while printing normal print jobs, as established by the excerpts from Dunand quoted above. For this reason alone, a prima facie case of anticipation has not been established, and the rejection should be reversed.

That Dunand does not disclose entering a diagnostic mode as recited in Claim 1 was undisputed by the Primary Examiner until the June 30, 2005 office action. For example, in the office action mailed June 21, 2004, at page 2, the Examiner stated, regarding Claim 1, "Dunand does not disclose the step of entering into a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed..." In the Office Action of June 30, 2005, however, the Examiner now states "Dunand discloses a diagnostic method ... comprising... entering into a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed (column 10, lines 13-32: The printer is being in the mode for printing a pattern of marks in which the printer prints the pattern marks (such as a dummy mark (column 7, lines 14-16) not in accordance to received image data as in the normal mode..."

Further, the "new" ground of rejection of Claim 1 was previously asserted by the Examiner in the Office Action of January 3, 2003, and withdrawn after applicants amended Claim 1 to include the limitation "entering a diagnostic mode

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of the printing system in which mode normal printing jobs of the printing system are not printed."

The Examiner points to two passages in Dunand as supporting the position that Dunand describes entering a diagnostic mode of the printing system as recited in Claim 1. These are set out below:

To prevent this type of overlapping, the printed pattern of marks in the even row is different from the pattern of marks in the odd row. Another case in which it is useful to distinguish the current mark from the next mark is the case in which these two marks would be simultaneously visible on detector 12, for example one on an extreme part of the detector on the input side and the other on an extreme part of the detector on the output side along the direction in which the substrate is moving. This situation can arise if the accumulated advance error reaches a positive value or negative value equal to half a nominal advance. In this case, the program will choose to use the reference mark to print the next band.

If a blockage or quasi-blockage is detected, the program could trigger another substrate advance command and then trigger an alert if the blockage is detected again, or otherwise immediately trigger an alarm.

The pattern of marks in even row bands and odd row bands will depend on the detector. [Dunand, at 10:13-32]

After the substrate has advanced, mark A is moved and occupies the position shown at B in FIG. 4. In order to materialize the error ϵ_x in the substrate advance, the position of a dummy mark has also been shown at C representing the nominal position that mark A would have had if there had been no difference between the nominal position and the real position. [Dunand at 7:13-17]

Applicants respectfully submit that the passages identified by the Examiner fail to provide evidentiary support for the rejection. The passage at 10:13-32 concerns the problem of an unplanned blockage of the substrate advance. "If the substrate is blocked, the mark printed while printing a current band [i.e. a print job] and that will be used as a position reference for printing the next band, will not arrive in the field of view of the detector 12.

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Therefore, the detector 12 will reuse the mark that was used for printing the current band with the same corrections, such that if the blockage or quasi-blockage of the substrate is not detected, the next band will be printed overlapping the previous band." Dunand at 10:5-12. To address this problem, Dunand describes that the printed pattern of marks in the even row is different from the pattern of marks printed in the odd row. Dunand at 10:13-16. The passage at column 10 identified by the Examiner thus fails to support the rejection; the marks printed in the margin are printed during printing of a normal print job.

The passage at column 7, lines 14-16, also does not support the rejection. The reference to a dummy mark is to a nominal position of a mark; the dummy mark is not a mark which is printed. See, 7: 18-19 ("The mark C is not present on the substrate in a real manner.")

For these reasons, and because the Office has previously acknowledged that Dunand fails to teach all elements of Claim 1, the rejection under Section 102 of Claim 1, as well as all claims depending therefrom, should be reversed.

At page 7 of the June 30th Office Action, the Examiner addresses applicants' arguments filed on April 11, 2003, that Dunand's printing of the pattern of marks is during printing of normal printing jobs. The Examiner states that "there is no evidence found in the reference to indicate that images are printed in a band except the pattern of marks. Therefore, the above applicants' assertion - seems to follow from common experience - is just attorney argument and not the kind of factual evidence that is required to rebut the rejection. (MPEP 2145 I)." The refusal to consider the weight of attorney argument in this case constitutes error.

MPEP 2145(I) refers to MPEP 716.01, subpart c, for examples of attorney argument which are not evidence and which must be supported by a declaration or affidavit. These examples are statements regarding unexpected results, commercial success, solution of a long-felt need, inoperability of the prior art, inventions before the date of the reference, and allegations that the author(s) of the prior art derived the disclosed subject matter from the applicant. None of these examples apply here, where the issue is the teaching of a published reference. This is not a case in which evidence extrinsic to the reference on which a rejection is based is required. The attorney argument at issue here is not

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mere unsupported argument, but rather argument supported by reference to the reference (Dunand).

Claim 3:

Claim 3 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, wherein said different areas are nominally aligned along a horizontal line; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

A prima facie case of anticipation of the subject matter of Claim 3 has not been established, for reasons similar to those just discussed regarding Claim 1. Moreover, the Examiner alleges that Dunand discloses printing different areas of a diagnostic pattern at different passes of one or more printheads with a controlled amount of media advances between the passes, wherein the different areas are nominally aligned along a horizontal line, referring to Dunand at column 5, lines 9-15, stating that "The different areas are the area of the current band and the next band, wherein the bands are aligned either along the direction of scanning of the head or the direction of advance of the substrate." (Office action, at paragraph bridging pages 2-3).

Appellants respectfully disagree. The quoted passage does not support the interpretation asserted by the Examiner, and is set out below:

a current band is printed with a first mark on the substrate,
the substrate is advanced to print the next band,
and algebraic difference is determined between a nominal theoretical position of the mark and the real position of the mark,

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The interpretation that the bands are aligned either along the direction of scanning of the head or the direction of advance of the substrate is not addressed by the quoted passage.

Moreover, the "different areas" asserted by the Examiner are areas of the normal print job, not of the marks printed in the margin, and so it is clear that the process occurs during printing of a normal print job.

Dunand does not describe the feature in Claim 3 that "wherein said different areas are nominally aligned along a horizontal line." In Dunand, the marginal marks printed with the bands and which are printed in different passes are not in a horizontal line.

Each mark in Dunand is printed in a single pass, not at different passes.

Claim 4:

Claim 4 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user.

The rejection of Claim 4 should be reversed because Dunand does not describe the feature that "said step of examining the diagnostic pattern is conducted visually by a user." In Dunand, the marginal marks are examined by an optical sensor for each successive band, and the examining is not conducted by a user. The reference describes printing a mark on each swath during normal printing, and measuring the position of that mark against its nominal position. Indeed, a user would be extremely unlikely to be able to visually measure the position of a mark against some nominal position, and printing speed would be slowed to a virtual crawl, since a measurement is made on each swath.

The Examiner does not address this feature of Claim 4 in the office action of June 30th. However, the Office previously took the position that Dunand did

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not describe that the examination of the marks is conducted by the user. (See office action mailed June 30, 2003, at page 6, paragraph 4).

Because a feature of Claim 4 is not addressed in the outstanding office action, and because the Office has previously taken the position that Dunand does not disclose the feature, a prima facie case of anticipation of Claim 4 has not been made, and the rejection should be reversed.

Claim 10:

Claim 10 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

The rejection of Claim 10 should be reversed for reasons similar to those discussed above regarding Claim 1.

Claim 12:

Claim 12 depends from Claim 10, and further recites that "said different areas are nominally aligned along a horizontal line." The rejection of Claim 12 should be reversed for reasons similar to those discussed above regarding Claim 3.

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Claim 13:

Claim 13 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode;

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user.

Similar considerations apply to Claim 13, as well as to Claim 14 depending from Claim 13, as discussed above regarding Claims 1 and 4.

C. The Requirements of 35 USC §103.

35 USC §103 requires that the invention as a whole must be considered in obviousness determinations. The invention as a whole embraces the structure, its properties and the problem it solves. In re Wright, 6 USPQ2d 1959, 1961 (Fed.Cir. 1988).

In order to provide a basis for obviousness, the applied references must be related to the subject matter of the invention in issue and must suggest (expressly or by implication) the combination of the invention in issue. In re Sernaker, 702 F.2d 989 (Fed.Cir. 1983).

Further, the combined teachings of the prior art references should suggest the advantage of combining the teachings. In re Sernaker, *supra*, at 995-996.

In determining the combined teachings of the applied references, the subject matter of the claimed invention must not be utilized to provide hindsight reconstruction of the applied references. As stated by the Court of Customs and Patent Appeals In re Shuman, 361 F.2d 1008 (CCPA 1966):

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It is impermissible to first ascertain factually what appellant did and then view the prior art in such a manner as to select from the random facts of that art only those which may be modified and then utilized to reconstruct appellants' invention from such prior art. 361 F.2d at 1012.

The Examiner bears the burden of establishing a prima facie case of obviousness based on the prior art. "... This burden can be satisfied only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references.' The patent applicant may then attack the Examiner's prima facie determination as improperly made out, or the applicant may present objective evidence tending to support a conclusion of nonobviousness." In re Fritch, 23 USPQ 1780, 1783 (Fed.Clr. 1992).

Appellants submit that the Primary Examiner has not established prima facie that the claimed invention would have been obvious in view of the applied references, and that the references do not teach or suggest the claimed invention.

D. A Prima Facie Case of Obviousness Has Not Been Established.

The Rejection of Claims 7 and 16

Claims 7 and 16 stand rejected under 35 USC 103 as being unpatentable over Dunand in view of Maeda. This ground of rejection is respectfully traversed, for reasons discussed above regarding Claims 1 and 10. A prima facie case of obviousness has not been established.

Claim 7:

Claim 7 depends from Claim 1, and further recites that the step of printing different areas of a diagnostic plot includes:

applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel

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will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed.

Claim 16:

Claim 16 depends from Claim 10, and further recites that the step of printing different areas of a diagnostic plot includes:

applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed.

The Examiner agrees that Dunand does not disclose the features of dependent Claims 7 and 16. Maeda is cited as allegedly showing printing different areas of a diagnostic plot. Appellants respectfully disagree with the recitation of the alleged teachings of Maeda. The embodiment illustrated in FIGS. 7-10 of Maeda is directed to the problem of an ink drawing phenomenon causing bleeding, resulting from laying down a dot right next to a just previously deposited dot. By depositing respective dots in a checkerboard fashion, the ink drawing phenomenon is said to be avoided. FIGS. 10A-10D show the technique of checkerboard printing using respective mask patterns. See, Maeda at 10:35 to 11:54.

The passages of Maeda cited by the Examiner do not pertain to a "diagnostic plot," or a "diagnostic multi-pass print mode mask," but rather to techniques of printing to avoid bleed during normal print operations.

Because Dunand admittedly does not show the features of Claims 7 and 16, and because Maeda does not supply the missing teachings of these claims, a prima facie case of obviousness has not been established.

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Appellants respectfully submit that the combination of references to form the grounds for the rejection is the product of improper hindsight reconstruction.

The Examiner further states that it would have been obvious to include the applying of a diagnostic multi-pass print mode mask as allegedly disclosed by Maeda into the advance control process as disclosed by Dunand, and that the motivation for doing so is to reduce the formed bind pitch to less than paper transport width without increasing the number of scans, so that banding artifacts are imperceptible as taught by Maeda at 4:4-10. The problem addressed by Maeda has nothing to do with the problem of media advance errors, and so the motivation asserted by the Examiner would not lead one to the solution set out in Claims 7 and 16. The rejection of Claims 7 and 16 should be reversed.

The Rejection of Claims 8-9, 17-18, and 20-21

These claims are rejected as being unpatentable over Dunand in view of Yen. This rejection should be reversed, on the grounds that a prima facie case of obviousness has not been established, and the applied references do not teach or suggest the claimed invention.

Claim 8:

Claim 8 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, said printing different areas of a diagnostic pattern comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, and wherein said diagnostic

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print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i); and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Dunand has been discussed above, and does not teach or suggest the features of these claims, for reasons similar to those discussed above regarding Claim 1 and 10.

Yen is cited as allegedly disclosing "printing patterns including the first $w/2$ pixels in the row are printed in the same pass, and the last $w/2$ pixels in the row are printed in another pass, wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes (FIG. 6), and wherein said different areas are nominally aligned along a horizontal line (FIG. 3)." Appellants respectfully deny that Yen discloses the foregoing teachings.

The Examiner holds that it would have been obvious to "modify the diagnostic print pattern disclosed by Gast, as modified, such as the first $w/2$ pixels are printed in a first pass and the last $w/2$ pixels are printed in a last pass of said plurality of passes as allegedly disclosed by Yen et al. The motivation of doing so is to eliminate unpleasant banding artifacts caused by ink migration as taught by Yen et al. (Abstract)." Appellants respectfully disagree with this holding.

Yen discloses a mask pattern having 4 by 4 triangular tiling clusters, as shown in FIG. 6, which provide a balance between reduction of banding artifacts and increase in image granularity. The mask pattern is not described as a diagnostic print mask, nor does Yen describe printing a diagnostic pattern. The Examiner refers to FIG. 3 as allegedly disclosing "said different areas are nominally aligned along a horizontal line," yet FIG. 3 is said to be a printed image produced by an inkjet printer, effectively 60x magnified to show a banding phenomenon. (Yen at 1: 61-65) It is not seen how this figure supports the Examiner's contentions.

Further, there appears no logical reason to modify Dunand as suggested by the Examiner. Ink migration is not a problem addressed by Dunand's media advance calibration. Here again, the rejection appears to be the product of

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attempted improper hindsight reconstruction, without reasoning clearly supporting the modification.

Similar considerations apply to Claims 9, 17 and 18.

Claim 20:

Claim 20 is drawn to a multi-pass diagnostic print mode mask for visual detection of poor media advance calibration in an ink-jet printing system including a printhead having a nozzle array, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, wherein said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i).

Dunand does not disclose a diagnostic print mode mask as recited in Claims 20-21.

The Examiner alleges that Yen discloses a diagnostic print mode mask, referring to FIG. 6 of Yen. However, FIG. 6 appears to show a print mask which is used during normal printing, and not a diagnostic print mode mask as recited in Claim 20. A prima facie case of obviousness has not been established, and the rejection of Claim 20 should be withdrawn.

Similar considerations apply to Claim 21.

The Rejection of Claims 6, 15 and 22

These claims have been rejected as being unpatentable over Dunand in view of Takagi. This rejection should be reversed, on the grounds that a prima facie case of obviousness has not been established, and the references do not teach or suggest the claimed invention.

Claim 6:

Claim 6 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

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checking for printhead health and taking any corrective needed action to recover nozzle health;

during a diagnostic mode in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

Dunand have been addressed above. Dunand does not describe checking for printhead health and taking any corrective needed action to recover nozzle health.

Takagi describes a recording apparatus to perform complementary recording to eliminate a white streak caused by recording elements becoming incapable of recording. Preceding printing, abnormal nozzles are detected, and data related to the abnormal nozzles are removed. One scan printing is performed in accordance with such data. Preceding the returning operation of the printing head subsequent to the one scan, a sub-scanning operation is performed so that normal nozzles are positioned in a location corresponding to the white streak appearing in the one scan printing. While returning the printing head, the printing is performed in accordance with such data related to the abnormal nozzles detected at the time of one scan, hence executing a complementary recording appropriately. (Takagi, Abstract)

Takagi thus has nothing to do with the problem of poor media advance calibration in an ink-jet printing system. Instead, Takagi addresses a case in which a nozzle of the printhead is not printing normally. The diagnostic mode of Takagi does not print different areas of a diagnostic pattern at different passes with a controlled amount of media advance between the passes, to accumulate media advance error. Nor is there any teaching in Takagi to examine a diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

The Examiner states that it would have been obvious to modify "the printing process disclosed by Dunand, such that including the step of entering diagnostic mode that checks printhead health and takes any corrective needed

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action as disclosed by Takagi et al. The motivation of doing so is to provide a liquid discharge apparatus capable of obtaining the desired result of discharges without any defects even when non-discharge or another malfunction occurs in the discharging means as taught by Takagi (*column 3, lines 60-65*).” (Page 7 of Office action) Appellants respectfully disagree.

Modifying Dunand with teachings of Takagi would at most result in a printing system with a diagnostic mode having an abnormal nozzle detection scheme, and using a sub-scanning operation to fill in white streaks caused by the abnormal nozzle. The diagnostic method of Claim 6 still does not result from the purported modification.

Claim 6 is even further distinguished from the combination of Dunand and Takagi because Takagi does not take any needed corrective action to recover nozzle health. The Examiner asserts that Takagi teaches corrective action to recover nozzle health prior to printing, stating that removing data related to abnormal nozzles recovers nozzle health. Appellants disagree; removing the data related to abnormal nozzles does not recover the nozzle health; rather this action merely results in the abnormal nozzles not being used.

Claim 15:

Claim 15 is drawn to a diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

- providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

- entering a diagnostic multi-pass print mode;

- checking for printhead health and taking any corrective needed action prior to printing a diagnostic pattern;

- printing different areas of the diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

- examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

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The rejection of Claim 15 should be reversed for the reasons discussed above regarding Claim 10, and further because the applied references do not teach or suggest "checking for printhead health and taking any corrective needed action prior to printing a diagnostic pattern" as discussed regarding Claim 6.

Claim 22:

Claim 22 is drawn to a diagnostic method for improving print quality in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode;

determining whether the nozzle array has good health;

if the nozzle array has good health, printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

The rejection of Claim 22 should be reversed for the reasons discussed above regarding Claim 10, and further because the applied references do not determine whether the nozzle array has good health, and if the nozzle array has good health, printing different areas of a diagnostic plot as recited in Claim 22.

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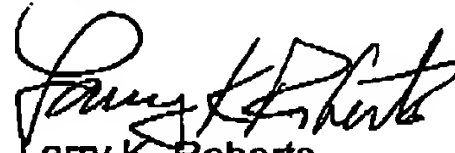
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VII. SUMMARY

The rejections under 35 USC §§ 102 and 103 must be reversed. A prima facie case of anticipation and obviousness has not been made, and the cited references do not describe, teach or suggest the claimed invention.

Respectfully submitted,



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APPENDIX I

1. (Previously presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

entering a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

2. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

entering a diagnostic mode of the printing system in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action; and

wherein said printing different areas comprises:

printing a first area comprising a first set of pixels printed during a first pass;

conducting a plurality of incremental media advances;

printing a further area comprising a second set of pixels printed during a further pass, wherein media advance errors resulting from said plurality of media advances are accumulated between printing said first area and printing said further area.

3. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

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during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, wherein said different areas are nominally aligned along a horizontal line; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

4. (Previously presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user.

5. (Original) The method of Claim 1, wherein said step of examining the diagnostic pattern is conducted by an optical sensor comprising the printing system.

6. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

checking for printhead health and taking any corrective needed action to recover nozzle health;

during a diagnostic mode in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

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7. (Original) The method of Claim 1, wherein said step of printing different areas of a diagnostic plot includes:

applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed.

8. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, said printing different areas of a diagnostic pattern comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, and wherein said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i); and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

9. (Previously presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

during a diagnostic mode of the printing system in which normal printing jobs of the printing system are not printed, printing different areas of a diagnostic

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pattern at different passes of one or more ink-jet printheads with a controlled amount of media advances between the passes, to accumulate media advance error between the printing of the different areas, said printing of a diagnostic pattern comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a), and the last $w/2$ pixels in the row are printed in another pass (b), wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes; and

examining the diagnostic pattern to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action,.

10. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

11. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

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providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode in which mode normal printing jobs of the printing system are not printed;

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action; and

wherein said printing different areas comprises:

printing a first area comprising a first set of pixels printed during a first pass;

conducting a plurality of incremental media advances;

printing a further area comprising a second set of pixels printed during a further pass, wherein media advance errors resulting from said plurality of media advances are accumulated between printing said first area and printing said further area.

12. (Original) The method of Claim 10 wherein said different areas are nominally aligned along a horizontal line.

13. (Previously presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode;

printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

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examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action, wherein said step of examining the diagnostic pattern is conducted visually by a user.

14. (Original) The method of Claim 10, wherein said step of examining the diagnostic pattern is conducted by an optical sensor comprising the printing system.

15. (Previously presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

entering a diagnostic multi-pass print mode;

checking for printhead health and taking any corrective needed action prior to printing a diagnostic pattern;

printing different areas of the diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

16. (Original) The method of Claim 10, wherein said step of printing different areas of a diagnostic plot includes:

applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed.

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17. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;
- providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;
- entering a diagnostic multi-pass print mode;
- printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas, said printing different areas of a diagnostic plot comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, wherein said diagnostic print mode mask defines that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i); and
- examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

18. (Previously Presented) A diagnostic method for visual detection of poor media advance calibration in an ink-jet printing system, comprising:

- providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;
- providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;
- entering a diagnostic multi-pass print mode;
- printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas, said printing different areas of a diagnostic plot comprising applying a diagnostic multi-pass print mode mask, wherein a plurality of carriage passes are employed

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to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i), wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are printed in a first pass, and said last $w/2$ pixels are printed in a last pass of said plurality of passes; and

examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

19. (Canceled)

20. (Previously Presented) A multi-pass diagnostic print mode mask for visual detection of poor media advance calibration in an ink-jet printing system including a printhead having a nozzle array, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, with each pixel location having a number associated therewith, the number representing the pass in which the pixel will be printed, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of pixels is printed on a different pass than said second set of pixels is printed, wherein said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i).

21. (Previously Presented) A multi-pass diagnostic print mode mask for visual detection of poor media advance calibration in an ink-jet printing system including a printhead having a nozzle array, wherein a plurality of carriage passes are employed to print the area subtended by a printhead nozzle array, the diagnostic print mode mask comprising a rectilinear grid of pixels and a row width of w pixels, and wherein said different areas include a first set of pixels on a row of said grid, and a second set of pixels on said row, and wherein said first set of

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pixels is printed on a different pass than said second set of pixels is printed, said diagnostic print mode mask defining that the first $w/2$ pixels in the row are printed in the same pass (a_i), and the last $w/2$ pixels in the row are printed in another pass (b_i), and wherein said diagnostic print mode mask includes a row wherein said first $w/2$ pixels are assigned to be printed in a first pass, and said last $w/2$ pixels are assigned to be printed in a last pass of said plurality of passes.

22. (Original) A diagnostic method for improving print quality in an ink-jet printing system, comprising:

- providing an ink-jet printhead mounted on a carriage, the carriage mounted for movement along a scan axis;

- providing a media advance system for advancing a print medium along a media path which is transverse to the scan axis;

- entering a diagnostic multi-pass print mode;

- determining whether the nozzle array has good health;

- if the nozzle array has good health, printing different areas of a diagnostic plot at different passes using said ink-jet printhead with a controlled amount of media advances between the passes to accumulate media advance error between the printing of the different areas; and

- examining the diagnostic plot to determine whether the accumulated media advance error is sufficiently objectionable to take corrective action.

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EVIDENCE APPENDIX

No evidence submitted pursuant to 37 CFR Sections 1.130, 1.131 or 1.132, or any other evidence entered by the Examiner, is relied upon by appellant in this appeal.

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RELATED PROCEEDINGS APPENDIX

There are no related proceedings and thus no decisions rendered in any such proceeding.